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have added, that, before this time, there is a long line of Assyrian kings, for many of whom the date can be fixed at least approximately. The author informs us that it has been supposed that the person kissing the foot of Shalmaneser on the black obelisk may be Jehu, king of Israel, whose name, he tells us, is mentioned in the inscription (p. 278). The Israelitish face of the kneeling figure, and the fact that the name Jehu (Assyr., *Ya-u-a-mar Hu-um-ri-i* = Jehu the son of Omri) stands immediately above the picture, ought to allow of no doubt in the matter. The statement (p. 285) that Shalmaneser, the predecessor of Sargon, is not once mentioned in the cuneiform inscriptions, is incorrect; for he is named in the Eponym canon (III. R. 1. col. V. 1),<sup>1</sup> and at least one other time (cf. George Smith: *The Assyrian canon*, p. 84). The

<sup>1</sup> R. is the usual way of representing the great collection of Assyrian texts called 'The cuneiform inscriptions of Western Asia,' of which Sir Henry Rawlinson is editor. The Roman numeral preceding indicates the volume; the following numerals refer to the page, column, and line.

author gives the conflicting opinions of Lenormant and Maspéro, as to the fate of the rebellious brother of Assurbanipal (p. 301). Assurbanipal's own statement is explicit to the effect that his brother was burned, though the gods are represented as having performed the work (V. R. 4. 46 ff.). It is misleading to say (p. 275) that the Assyrian kings never tried to hold by mild government their conquered provinces; for the later kings at least often bestowed favors on captive princes, not seldom replacing them on the throne. Such cases of inaccuracy and uncertainty might be multiplied. The writer knows too little of recent work in Assyriology, and does not hesitate to express his scepticism as to the way in which Assyrian students read proper names (pp. 271, 301). One who has not studied the language for himself can, of course, not yet write a history of Assyria and Babylonia. The book has the credit of brevity, and gives very well a general impression, but cannot be relied upon in detail.

## WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

### ASTRONOMY.

**Transit of Venus observations at Helderberg, N.Y.**—Mr. R. H. Tucker, jun., of the Dudley observatory, gave a detailed account of the arrangements for, and results of, his observation of the transit of Venus, at a station established for the purpose on the Helderberg table-land, about thirteen miles westward from the city of Albany. The site chosen was the U.S. coast and geodetic survey, and the N.Y. state survey station, Helderberg; lat.  $42^{\circ} 37' 38''$ , long.  $74^{\circ} 00' 39''$ ; altitude, 1,823 feet. The cloudiness which prevented the observation of either contact at the Dudley observatory was but partial at the Helderberg station, and a satisfactory view of the second contact was realized. An estimate was also made of the time of the first contact, based upon a comparison of the phase first seen a few minutes later, with diagrams constructed in connection with preliminary practice.

The errors of the chronometers were obtained by heliotrope signals, and powder-flashes from the Dudley observatory, and by sextant observations of the sun. — (*Albany inst.*; meeting Jan. 2.) [80]

**Transit of Venus observations at New Haven.**—Prof. H. A. Newton described his temporary mounting by which he used the eight-inch Grubb object-glass of the observatory to observe the contacts. Dr. L. Waldo referred to the preliminary drill with the Yale heliometer which the five observers and assistants with that instrument had undergone, and said that the results were extremely satisfactory. The definition was good most of the day, and the instrument and dome was manipulated quickly with no waste of time. He gave the following summary: 24 half sets of 4 pointings each, 10 whole sets of 8 pointings each, 20 single pointings on Venus for its diameter, 10 position measures at ingress, and 6 position measures at egress, with time observations of

the four contacts. Mr. Willson described an arrangement by which he had put a cast-iron cylindrical plate-holder in the eye end of the Grubb telescope, and had projected a mercury horizontal surface, together with the reticule glass lines on each of the hundred and fifty or more photographs he had reason to think would develop well. He also described a ten-foot rod caliper he had used in measuring the plate distance from the object-glass. He used a simple crown lens of about one inch and a quarter aperture, and ten feet focal length.

Mr. Sherman, through the courtesy of the scientific school, used the nine-inch equatorial, and obtained about eighty-seven sets of transits of Venus and the sun's limbs across a system of inclined lines ruled on glass. Professors Van Vleck, Lyman, Wright, and Brewer took part in the discussion following the above papers; and, after describing their own contact observations, referred to the atmosphere of Venus, and in general regarded the want of intense blackness of Venus's disc as an effect of contrast with the sun. — (*Conn. acad. arts sc.*; meeting Dec. 20.) [81]

### MATHEMATICS.

**Septic transformation.**—Mr. Ely has obtained the modular equation for the septic transformation by a purely algebraical process. Aside from the result directly arrived at, the paper is valuable as affording a clew as to the (algebraical) methods of procedure to be followed in obtaining the odd prime transformations of higher orders. — (*Proc. Lond. math. soc.*, 1882.) T. C. [82]

**Transformation of elliptic functions.**—This paper, by Professor Smith of Oxford, is too important for a brief abstract. On its completion, a proper review will be given of its contents. — (*Mess. math.*, 1882.) T. C. [83]

**Curves of any deficiency.**—Mr. Buchheim ex-

tends the theory of Steiner's polygons and Prof. Sylvester's theory of derivation to the case of curves of order  $n$  and deficiency  $p$  in an  $(n-p)$  flat. The extension involves the use of Abelian functions instead of elliptic functions, as in the case of a plane cubic, and is based principally upon Clifford's well-known paper, On the classification of loci. — (*Proc. Lond. math. soc.*, 1882.) T. C. [84]

**Fourier's functions.** — M. Nicolas prefers to denote, by this title, the functions more commonly known as Bessel's or cylindric functions. The author studies principally the different modes of representation of these functions by definite integrals and series. A novelty is the introduction of a method of Euler's in finding the development in form of a series of the functions of the second kind. — (*Annales école norm.*, xi., suppl., 1882.) T. C. [85]

**Geometry of  $n$ -dimensions.** — The author, M. V. Schlegel, here extends certain well-known theorems of ordinary plane and three-dimensional space geometry to a space of any number of dimensions. The paper deals only with completely limited figures, regular and irregular. A *homogeneously limited figure* is defined:  $1^\circ$ , as one in which each summit meets the same number of edges, planes, solids, etc.;  $2^\circ$ , as one in following any edge of which we meet the same number of edges, planes, etc. Writing 'homogeneous' instead of 'limited homogeneously,' we see that all plane polygons are homogeneous, etc. The author uses the methods of Grassman, and extends to hyperspace theorems concerning the triangle, quadrilateral, tetrahedron, hexahedron, and octohedron. — (*Bull. soc. math. France*, x., 1882.) T. C. [86]

**Curves whose co-ordinates are elliptic functions.** — R. von Lilienthal discusses two classes of spherical curves having the following properties: The constants in the expressions for the co-ordinates, with the exception of one (which, with the modulus, is arbitrary), can be so determined that the sought curve shall lie on a sphere. The length of an arc of the curve can be given as an elliptic integral of the first kind increased by the difference of two elliptic integrals of the third kind.

For the second group of curves, the arbitrary constant can be so determined that the integral giving the length of arc shall be an elliptic integral of the first kind. It is also shown that the curves of the second kind lie on algebraical cylinders. — (*Journ. reine angew. math.*, xciii., 1882.) T. C. [87]

**Applications of the theory of binary forms to elliptic functions.** — The author, Faà de Bruno, expresses the elliptic functions by aid of the absolute invariant, and gives a very rapidly converging series for the computation of the complete elliptic integral of the first kind. — (*Amer. journ. math.*, 1882.) T. C. [88]

**Rotation of a solid body.** — This treats the case of rotation of a solid body about a point which is in general neither the centre of gravity of the body nor (in the case of a body of revolution) a point on the axis of revolution. The author, W. Hess of Munich, discusses the general case, and obtains several interesting theorems on making particular hypotheses as to the position of the point about which the body rotates. — (*Math. annalen*, xx., 1882.) T. C. [89]

**Vibrations of an elastic sphere.** — Prof. H. Lamb here discusses the problem of the vibrations of an elastic solid whose dimensions are all finite. He has given several numerical calculations and diagrams, illustrating, in special cases, the results arrived at by the purely mathematical investigation. The author points out that the results of his analysis differ from the views advanced by Lamé (*Théorie de l'élasticité*)

as to the nature of the fundamental modes of vibration of elastic solids in general; and indicates the error in Lamé's reasoning as consisting in the tacit assumption that a wave undergoes no change of character on reflection at the bounding surface of a solid, — an assumption the incorrectness of which was previously shown by Green. — (*Proc. Lond. math. soc.*, 1882.) T. C. [90]

**Subinvariants.** — An important paper by Professor Sylvester, of which, since it is not yet completed, a review will be given at a later date. — (*Amer. journ. math.*, v., 1882.) T. C. [91]

## PHYSICS.

**Apparent attractions and repulsions of small floating bodies.** — The need of a thoroughly sound and at the same time simple popular explanation of capillary phenomena will probably make every teacher of elementary physics take up Prof. Leconte's article with interest. As he states, ordinary treatises are somewhat unsatisfactory upon this subject, even when they are not actually wrong. For instance, the in general excellent treatment of capillary action in Everett's 'Deschanel' handles the phenomena observed in a vacuum in a very gingerly manner, hinting at a certain mysterious pressure in the interior of liquids due to molecular action at the surface, even when such surface is plane, in order to account for the rise of liquids in fine tubes in a vacuum.

In view of the fact that the capillary action of liquids is practically the same in a vacuum as in air, Prof. Leconte appears to be of the opinion that it is unnecessary to take account of atmospheric pressure in explaining any of these phenomena. He proposes to base his explanation upon two 'fundamental principles': 1. "That in every case, whether of moistened or non-moistened bodies, there exists an adhesion between the solid and the liquid." 2. "That the capillary forces are, in any given case, inversely proportional to the radii of curvature of the menisci, and their resultants, directed toward the centres of concavity."

We suppose Prof. Leconte will admit, however, that although the visible phenomenon of water sustained in a capillary tube, for instance, may remain unchanged when the surface of the water is relieved of the pressure of the atmosphere, the actual condition of water in the tube and of the film at the top of the column is somewhat changed. Thus Young says in his memoir on the 'Cohesion of fluids,' "when the surface is concave, the tension is employed in counteracting the pressure of the atmosphere, or, where the atmosphere is excluded, the equivalent pressure arising from the weight of the particles suspended from it by means of their cohesion," etc. In fact, it would seem the better plan in explaining the above phenomenon, to make full use of the unquestionable agency of the atmospheric pressure, so long as the atmosphere is present, and be thankful for it, since it is far easier to understand than the sustaining by cohesion that must take its place in a vacuum.

Prof. Leconte's statement of his second principle is a little puzzling; for a natural interpretation of his words would be, that he supposes the *surface tension* to be inversely proportional to the radius of curvature of the film. He applies his two principles to the explanation of three typical cases of attraction and repulsion. In the case of two moistened bodies he says, "But when brought so near that their menisci join each other, the radius of curvature of the united intervening concave meniscus . . . is less than that of the exterior concave menisci, . . .

and its superior tension acts upon both bodies toward a common centre of concavity."

We do not think physicists generally will admit that a liquid film tends to draw a solid, to which it is attached toward the centre of concavity of the film. Indeed, if this were so, the tendency of a column of water raised between two floating bodies by surface tension would be to lift those bodies: similarly a column of liquid sustained in a fine tube would tend to lift the tube. This action, however, is denied both by theory and experiment. In fact, unless we have misunderstood Prof. Leconte's language and diagrams, his article will not do all that it was intended to do, toward removing the difficulties in the way of a student beginning the study of capillary phenomena. — (*Amer. Journ. sc.*, Dec., 1882.) E. H. H. [92]

**Rigidity of the earth.** — G. H. Darwin discusses the long-period tides — the lunar fortnightly declinational and the lunar monthly elliptic — from 33 years' observations in England, France, and India, and finds that they are reduced to 0.7 of their theoretic height. There should be no reduction on a rigid earth, and no ocean tides on a liquid earth: as the actual effect of the earth's yielding to the moon's attraction is only 0.3 of the difference between these extreme effects, the earth is considered at least as rigid as steel. — (*Nature*, Nov. 2, 1882.) W. M. D. [93]

#### Optics.

**Molecular refraction.** — In an investigation on the refractive powers of carbonic ether and its sulphur substitution products, E. Wiedemann finds that the atomic refraction of sulphur depends upon its place in the molecule as does that of oxygen. — (*Wied. ann.*, Dec., 1882.) C. S. H. [94]

**Dispersion formulas.** — A. Wüllner shows that in a large number of colorless substances, in which case the absorption constant may be regarded as zero, two of the constants in Helmholtz' dispersion formula are sensibly equal, and the formula reduces to one of two constants, which is then equivalent to that of Lommel. The same was found to hold true of an alcoholic solution of alizarine, as also of an aqueous solution of amonio-sulphate of copper. — (*Wied. ann.*, Dec., 1882.) C. S. H. [95]

**Diffraction.** — A series for the calculation of Fresnel's integrals, and a table of values, are given by A. Lindstedt. — (*Wied. ann.*, Dec., 1882.) C. S. H. [96]

#### (Photometry.)

**Photometric observations of the transit of Venus.** — Professor E. C. Pickering has made some comparisons of the brilliancy of the sun, of Venus, and of the region in the immediate vicinity of the limb of the sun, whereby the photometric illumination of that portion of the corona may be determined. An ordinary double-image-prism photometer with a few slight modifications, attached to the tail-piece of the 15-inch equatorial, was employed for the observations. Calling the light of the sun 100, the mean of thirty-two settings taken between 1 h. 07 min., and 1 h. 30 min., Cambridge mean time, gave: Venus 1.8, and the sky 8.8. The mean of twenty-four settings taken between 2 h. 48 min. and 2 h. 54 min. gave: Venus 1.4, and the sky 6.2. The mean of all gave: Venus 1.6, and the sky 7.5 or 4.7 times as bright as Venus. [According to this, the light of this portion of the corona would seem to be about 3.7 times as brilliant as the light reflected by that portion of our atmosphere lying between us and the sun.] — W. H. P. [97]

#### Heat.

**Thermal conductivity of rocks.** — A novel method has been employed by M. Thoulet for the

determination of the thermal conductivity of minerals and rocks. Instead of measuring the temperatures at different distances from the source of heat, measurements are taken of the time required for the passage of a certain quantity of heat through a section of known thickness. The 'thermal resistance' is defined as the time required for the passage of a definite quantity from a source at 100° C. through a thickness of 0.01 mm. The thermal resistance is consequently inversely proportional to the thermal conductivity. Glass and iron have already been experimented on, and the method appears to give very accurate results. — (*Ann. chim. phys.*, (5), xxvi. 261.) C. B. P. [98]

**Heat of combination a function of atomic weight.** — Mr. Laurie shows, that if the atomic weights of elements are taken as abscissae, and their atomic heats of combination with chlorine, bromine, or iodine, as ordinates of a curve, the heats of combination will be seen to be a periodic function of the atomic weights. — (*Phil. mag.*, Jan., 1883.) C. B. P. [99]

#### Electricity.

**Electrical resistance of selenium cells.** — In a communication to the Physical society of London in June, 1881, Dr. James Moser urged that the decrease in electrical resistance observed in a 'selenium cell' when acted upon by a beam of light, is due to heating, which by expanding the selenium makes it press more firmly against the metallic electrodes of the cell, thus establishing better connection. The fact that luminous are more effective than obscure rays in producing the observed change, Dr. Moser sought to explain as a result of selective absorption. Mr. Sheldford Bidwell undertook to put Dr. Moser's theory to the proof by heating selenium cells to known temperatures in the dark, and observing the consequent change in electrical resistance. It appears from his experiments, that below a certain temperature, which is different for each cell, heating increases the electrical resistance of the cell; that above this temperature heating decreases the resistance, the temperature of maximum resistance being usually somewhat above ordinary temperature, but in one case being 13° C. Mr. Bidwell concludes, however, that the action of the luminous rays upon the cell cannot be explained by their heating effect alone; for he finds that whereas a moment's exposure to direct sunlight, though causing a great fall of electrical resistance, yet heats the selenium to a hardly perceptible extent, an equal decrease of resistance caused by heating in the dark could be produced only by making the cell too hot to handle. Mr. Bidwell concludes from his experiments that the action of the carbon photophone is to be explained by the heating alone. — (*Phil. mag.*, Jan., 1883.) E. H. H. [100]

#### ENGINEERING.

**Practical test of the safety of bridges.** — It is well known among engineers, that, with good iron properly used, our bridges may be relied upon for an indefinite length of service. The best practice never loads a structure with more than from one-fourth to one-sixth of the weight that would break it down. Any load put upon a piece of iron will stretch it to a slight extent. Upon removing the load, the iron should regain its original form. This it will do if it has not been overstrained. A very simple and effective piece of mechanism has been for some time in use at the East-River suspension-bridge at Brooklyn for determining the precise effect of any load upon any part of the structure. A bar ten or twelve feet long is attached to any member of the bridge in such a manner that any increase in the length of such

member is at once imparted to the standard bar, and is so multiplied by delicate mechanism as to become plainly visible. In testing a bridge, a movable index upon the standard bar is first placed at zero. A load is then run on to the bridge, when the index moves on account of the stretch imparted by the bridge to the standard bar. The weight is now removed from the bridge, when the index returns to zero unless the iron has received a permanent elongation from the load—that is, unless the iron has been overstrained. Not only does this method enable us to determine whether a bridge is safe for the time being; but we can also answer the not less important question, whether the bridge is holding its vitality through long periods of time. The above apparatus is so delicate as to indicate a strain on the iron less than a thousandth part of the weight that would break it. By means of this device, not only do we substitute exact measurement for mere opinion, but we are enabled to answer a good many vexed questions in regard to the precise condition of complex structures of iron. G. L. V. [101]

**Cable power for street-railways.**—There is probably no more abused piece of motive power than the horse which draws our street-cars. Leaving out of view the outrageous cruelty to which these unfortunate animals are often subjected, it may well be questioned whether such power is in any way economical. Whether steam or electricity will soon be employed upon street railways, may be questioned; but there is reason to think that the so-called cable system may furnish a solution to many of the problems in city transportation. There is nothing new in the idea of a continually moving, endless wire cable beneath the roadway, to which cars may be attached at any point; but to reduce the idea to practice involves a good deal of mechanical skill and a very considerable expense. Mr. J. D. Miller gives a description of the Chicago cable roads, in which he states, that, in October last, there were in Chicago over four miles of cable roads in operation,—an amount which has been largely increased since that time. The first cost of these roads is reckoned to be not less than \$100,000 a mile for a double track. The cost of operation is said to be much less than by the common method, the percentage of saving being greater as the traffic becomes larger. — (*Journ. assoc. eng. soc.*, Oct.) G. L. V. [102]

**Tests of building materials.**—An important series of experiments upon the strength of timber has been for some time past carried on by Professor Gaetano Lanza at the institute of technology in Boston, and also at the Watertown arsenal. The experiments from which the data in our books have been determined were in nearly all cases made upon very small and very carefully selected pieces of well-seasoned wood. From the data thus obtained we have assumed that we could at once pass to the more or less defective and generally quite unseasoned timber which is employed in actual work. This method has often led to most absurd and unreliable results, and has been a fruitful source of that discordance which so often appears between science and practice. Instead of small wooden beams an inch square and two or three feet long, Professor Lanza uses beams twenty feet long and of the common sizes used in building; and, instead of the perfectly clear and well-seasoned material employed by the older experimenters, he takes his beams just as they come from the lumber-yard. In fine, the experiments now being carried on are as far as possible under the real conditions of practice, and not under the imaginary conditions of the closet. The result of these experiments will put into the hands of the engineer far

better data for fixing the dimensions of the important structures on which our lives depend than we have before possessed. — G. L. V. [103]

#### CHEMISTRY.

**Reproduction of the osmides of iridium.**—By heating iridium with iron pyrites, M. Debray obtained it in octahedrons of the regular system, which were removed from the sulphide by dissolving out the latter with hydrochloric acid. Mixtures of iridium and osmium treated in a similar manner gave regular octahedrons which resembled in all respects the natural osmides. The natural osmides are thus shown to be isomorphous mixtures, crystallizing probably in the regular system. — (*Comptes rendus*, xcv., 879.) C. F. M. [104]

**Thorite and the equivalent of thorium.**—In a variety of thorite recently discovered at Arendal in Norway, L. F. Nilson finds a large percentage of iron, lead, and uranium, the latter in the form of dioxide. To separate thorium from cerium oxide, after precipitating the oxalates they were converted into sulphates, and advantage was taken of the slight solubility of hydrous thorium sulphate at 0°. In determining the atomic weight of thorium, the purified sulphate  $\text{Th}(\text{SO}_4)_2 \cdot 9\text{H}_2\text{O}$  was ignited at first gently to expel the crystal water, then to a glowing white heat until the acid was driven off. As a mean of ten determinations calculated from the residue  $\text{ThO}_2$ , the value 235.43 was obtained. The metal was prepared in nearly the theoretical quantity by igniting potassium thorium chloride mixed with a few grms. of salt, and covered with sodium in a tube filled with salt. When heated in a current of chlorine gas, the metal is converted into the chloride. It unites readily with bromine and iodine, and is easily soluble in acids. Under no conditions does it decompose water, nor is it attacked by alkaline hydrates. — (*Berichte deutsch. chem. gesellsch.*, xv., 2519.) C. F. M. [105]

**Modification of the law of isomorphism.**—An examination of the isomorphous metatungstates and tungstoborates, by D. Klein, led to results which could not be explained by the law of Mitscherlich. A better interpretation was found in a modification of the latter part of this law, first proposed by M. de Marignac. "Isomorphous bodies either have a similar chemical composition, or they consist chiefly of the same group of elements or of groups with identical chemical functions." — (*Comptes rendus*, xcv., 781.) C. F. M. [106]

**Electrolysis of hydrochloric acid.**—In the electrolysis of hydrochloric acid, using platinum electrodes, D. Tommasi finds that the heat absorbed in decomposing two molecules of the acid amounts to 78.6 cal. Since platinum chloride was found in solution, a certain quantity of the electromotive force (not determined) must have been absorbed in its formation. One Daniell's cell ( $E=49$  cal.) with one zinc-cadmium element ( $E=16.6$ ) decomposed the acid, but no chlorine appeared at the positive pole. With two Daniell's cells, bubbles of an oxide of chlorine were observed. When dilute hydrochloric acid (1 conc. acid : 20  $\text{H}_2\text{O}$ ) was subjected to electrolytic action, the liquid at the positive pole became yellow and exerted a strong bleaching action. M. Tommasi regards this action as due to the formation of hypochlorous acid which attacks the electrode in the concentrated acid solution. — (*Comptes rendus*, xcv., 689.) C. F. M. [107]

**Changes of volume and of molecular arrangement in hydrous salts.**—An unequal expansion of the alums when heated led E. Wiedemann to con-

clude that a molecular re-arrangement (*umlagerung*) takes place below 70°. Different volumes of the salt  $\text{Mg. SO}_4 \cdot 6 \text{H}_2\text{O}$  at 93° and 50° point to a new modification at 93° since Marignac determined its composition at 50°. The salt  $\text{Zr SO}_4 \cdot 6 \text{H}_2\text{O}$  also shows a difference in volume at 40° and 69°. — (*Ann. phys. chem.*, n.f., xvii., 561.) C. F. M. [108]

#### METALLURGY.

**A great feat in metal-working.** — Messrs. Klonan rolled a steel strip 6 in. wide,  $\frac{1}{4}$  in. thick, and 310 ft. long, at their mill at Allegheny. They have contracted with the U. S. spring car motor construction company for an unlimited number of these steel springs. This company had previously applied to all the large English and continental works, and to other American works, without finding any one ready to undertake the work. — (*Iron*, Nov. 17, 1882.) R. H. R. [109]

**Molecular condition of metals.** — Kalisher has found that sheets of most metals may be rendered crystalline by heat. A zinc sheet will become crystalline at 307° F.: tin and cadmium at 392° to 536°. Most metals obtained by electro-metallurgy give the same result. — (*Iron*, Dec. 8, 1882.) R. H. R. [110]

**Steel-iron.** — M. Keil has succeeded in producing a welded metal which is stated to possess the characters of both iron and steel. It is prepared by pouring the fluid steel on one side of a partition in a mould, and fluid wrought iron on the other: the partition is made of such thickness that it will weld by the heat of the added fluids. This so-called steel-iron is said to have been prepared in five ways: 1°, steel by the side of iron; 2°, steel between two layers of iron; 3°, iron between two layers of steel; 4°, a core of steel surrounded by iron; 5°, a core of iron surrounded by steel. — (*Iron*, Dec. 15, 1882.) R. H. R. [111]

**Compression of metals.** — An improved method of treating all kinds of metals and alloys has been patented by Mr. Louis Clemandot of Paris; it consists in subjecting them, when raised to a temperature sufficiently high to insure the necessary ductility, to powerful compression, and then allowing them to become completely cool while still under pressure. An increased density and hardness is claimed for metals thus treated. — (*Min. and sc. press*, Nov. 18, 1882.) R. H. R. [112]

#### MINERALOGY.

**Axinite.** — Crystals of this mineral from near Bethlehem, Penn., have been studied by B. W. Frazier. He endeavors to show the resemblance in crystalline form between this mineral and datolite. Placing the crystals in position so that the zone  $p$ ,  $l$ , and  $u$  shall be parallel to the vertical,  $p$ ,  $m$ , and  $r$  to the macro-diagonal, and  $y$ ,  $m$ , and  $b$  to the brachydiagonal axes, the following relations are obtained from v. Rath's measurements:—

$$\begin{array}{l|l} \bar{b} \wedge \bar{c} = a = 81^\circ 56' 59'' & O \wedge i \bar{i} = A = 82^\circ 09' 48'' \\ \bar{x} \wedge \bar{c} = \beta = 91^\circ 51' 28'' & O \wedge i \bar{i} = B = 90^\circ 04' 21'' \\ \bar{a} \wedge \bar{b} = \gamma = 102^\circ 52' 14'' & \bar{i} \wedge i \bar{i} = C = 102^\circ 44' 18'' \\ \bar{a} : \bar{b} : \bar{c} = 1 : 1.56903 : 0.48742 \end{array}$$

The corresponding for datolite are

$$\begin{array}{l|l} \beta = 90^\circ 06' & O \wedge i \bar{i} = B = 90^\circ 06' \\ \bar{a} : \bar{b} : \bar{c} = 1 : 1.5712 : 0.49695 \end{array}$$

Besides the relation in axial lengths and angle  $\beta$ , a still closer relation is shown in the angles between corresponding planes. The author also calls attention to the similarity in crystalline form between datolite

and calamine, — the latter having the axial relation,  $\bar{a} : \bar{b} : \bar{c} = 1 : 1.5564 : 0.47657$ , — and their similarity in composition, datolite being  $\text{H B Ca Si O}_5$ , calamine  $\text{H}_2 \text{Zn}_2 \text{Si O}_5$ . He can, however, show no relation between their composition and that of axinite. — (*Amer. journ. sc.*, Dec., 1882.) S. L. P. [113]

**Saussurit.** — By means of microscopical investigation, A. Cathrein has shown that this mineral is composed of numerous microlites of zoisite in a ground mass of feldspar. He also shows, by calculation from various analyses and optical examination, that the mineral has been derived from plagioclase, more seldom orthoclase, by a loss of silica and alkalies, and taking-up of lime, iron, and water; and that thereby the minerals zoisite and epidote have been formed, giving rise to the microlites, which with the remnant of feldspar make up the mass. — (*Zeitschr. kryst.*, vii. 243.) S. L. P. [114]

**Danburite.** — This interesting mineral, of which such beautiful examples have been described by Professors Brush and Dana from St. Lawrence County, N. Y., has been lately discovered at Scop, in Canton Graubünden, Switzerland, and fully identified and described by C. Hintze. The crystals occur in prisms 2–15 mm. long,  $\frac{1}{4}$ –3 mm. broad; are colorless to wine-yellow, and brilliant. The author gives the results of crystallographic measurements, which agree very closely with those obtained from the American crystals with some additional new planes. In habit the crystals vary much from the American. As terminal planes, the pyramid (142), often occurring alone, and macrodome (101) are most frequent. The base, which never fails on the American crystals, was but once observed, and then as a doubtful crystal plane. The prismatic zone appears very much striped. On account of the abnormal size of one of the dome-planes or two adjacent pyramidal planes, the crystals often have a decided monoclinic appearance. The optical properties coincide with those of the American variety. — (*Zeitschr. kryst.*, vii. 296.) [115]

The above mineral has been analyzed independently by C. Bodewig and A. Schrauf, giving results which are wholly in accordance with the analyses of the American mineral. C. Bodewig's analysis gave  $\text{Si O}_2$  48.66,  $\text{Ca O}$  22.90,  $\text{B}_2 \text{O}_3$  28.09,  $\text{Fe}_2 \text{O}_3$  0.23,  $\text{Al}_2 \text{O}_3$  0.08 = 99.96. — (*Zeitschr. kryst.*, vii. 391.) S. L. P. [115]

#### GEOLOGY.

##### Lithology.

**The trachytic rocks of Tokay, Hungary.** — Professor Szabó gives in this paper the outlines of his new classification of trachytic rocks, the term trachyte covering for him about as extended a range as the term 'greenstone' used to do. His divisions are as follows:—

##### A. TRACHYTE WITHOUT BIOTITE.

I. *Augite-trachyte*; with anorthite-bytownite, without biotite or quartz. Olivine very rarely found.

II. *Amphibole-trachyte*; with labradorite-bytownite, augite rarely entirely absent. Quartz wanting.

##### B. TRACHYTE WITH BIOTITE.

III. *Micaceous-amphibole-trachyte*; with aude-site-labradorite; with or without quartz, augite, and garnet.

IV. *Micaceous-amphibole-trachyte*; with oligoclase-andesite, with or without quartz and augite.

V. *Micaceous trachyte*; with orthoclase-oligoclase, with or without quartz and amphibole. Augite rarely absent.

The micaceous trachytes are regarded as older than

the others. The paper contains a discussion of the geological relations of the trachytes in general.

The Tokay rocks are the following: 1. Augite-trachyte. 2. Amphibole-trachyte. 3. Micaceous-quartz-trachyte. 4. Conglomerates and trachytic tufas. 5. Red plastic clay. 6. Prehistoric and recent alluvium.

The microscopic, chemical, and geological characters of the rocks are given, with a discussion of their former nomenclature. — (*Assoc. franç. avanc. sc.*, x. 532.)

In this connection attention may be drawn to two other papers by the same author, relating to the classification of the trachytes: *Classification macrographique des trachytes* (*Bull. soc. géol. France*, Dec. 7, 1881); and *Die makrographische eintheilung der trachyte*. — (*Verhandl. k.-k. geol. reichsanst.*, 1882, 166.) M. E. W. [116]

**A new basaltic rock.** — The name pyroxenite is given by Dr. C. Dölter to a rock from the Cape Verde Islands, composed of augite, magnetite, and a glassy base. — (*Verhandl. k.-k. geol. reichsanst.*, 1882, 140.) M. E. W. [117]

#### METEOROLOGY.

**Ohio state weather service.** — This service, recently organized, has begun the publication of monthly reports. The November issue contains returns from nineteen stations, including five maintained by the U. S. Signal Service, accompanied by a well-arranged monthly summary. — w. u. [118]

**Observations at high stations.** — The Austrian meteorological service established in 1880 self-recording instruments at Klagenfurt and Obirgipfel, stations situated near each other geographically, but having altitudes of 438 and 2,044 met. respectively. Hourly observations to the end of the year 1881 have been recently published, embracing those of pressure at both stations and of temperature at Klagenfurt only. — (*Jahrb. k.-k. centr. anst. meteor.*, 1882.) w. u. [119]

**Rainfall statistics.** — Systematic observations of rainfall throughout France are made by the Bureau central météorologique. The results for 1880, deduced from 1,291 stations, have been collected and studied by M. Th. Moureaux, who publishes twenty-five charts in illustration: eight of these are designed to exhibit the connection between rainfall and barometric depressions, and confirm the opinion advanced by Prof. Loomis from his studies of the U. S. weather-maps, that rain is most abundant in advance of a depression, and that therefore the direction in which a storm will move can be foretold by the distribution of the rain areas. (*Sur le régime des pluies en France pendant l'année 1880.*) Mr. Symons, through whose efforts more than 2,000 stations in Great Britain have been established, has published valuable suggestions for securing uniformity of practice among rainfall observers. — (*Symons' meteor. mag.*, Dec., 1882.) w. u. [120]

**Floods in France.** — Camille Flammarion describes the year ending with November, 1882, as one of very numerous rainy days, although of normal rainfall, in France. In Paris the rainfall at the Montsouris observatory was 543 mm., closely agreeing with the average of other years; but the number of rainy days was 208, and besides these, 100 more were cloudy. As a result, summer evaporation, which ordinarily disposes of much of the rainfall, was this year very ineffective; the ground became saturated, and when the November rains (113 mm.) came, the rivers rose rapidly throughout the country. — (*Le Voltaire*, Paris, Dec., 1882.)

Th. Moureaux gives further account of the rising of the Seine early in December. — (*La Nature*, Dec. 23, 1882.) w. m. d. [121]

**Auroras.** — An extensive catalogue of auroras observed in Sweden from 1800 to 1877 has been published by R. Rubenson, director of the meteorological institution of Sweden. It forms the second part of the catalogue of auroras observed since the sixteenth century. The appendix contains descriptions of the auroras, and tables of the annual variation in frequency, and the years of maxima and minima. — (*Cat. aurores bor. observ. en Suède, 16th cent.* — 1877, part 2.)

Mr. J. Rand Capron calls attention to the fact, that the auroral display in November was followed by first a cold and then a warm wave. The doubt raised as to the character of the supposed auroral beam, which was observed in England, and from which the height of the aurora has been calculated, is removed by the statement that it gave the auroral spectrum. — (*Nature*, Dec. 28, 1882.) w. u. [122]

#### GEOGRAPHY.

(*Arctic.*)

**Theory of an open polar sea.** — Mr. George R. Howell, of the New-York state library, read a paper favoring this theory. He remarked that the field of new exploration is rapidly narrowing to that of the north polar region. Among the reasons for the open-sea theory are:—

1°. Water-fowl go regularly each spring northward from Greenland for nesting. As the ice-barrier from 73° to 82° is too cold for birds to raise their young, their nesting-places must be north of this barrier, and in a milder climate. 2°. The occurrence of warm winds from the circumpolar regions, as verified by explorers in high latitudes. 3°. The occurrence of furious gales during the long arctic winter, which would be unaccountable if the region for ten degrees around the pole were as cold as the zone of the ice-barrier, and therefore as calm as the equatorial belt. 4°. Morton and Hayes both saw open water in Kennedy channel as far as the eye could reach northward.

Mr. Howell spoke of the agency of the gulf stream, which is commonly regarded as limited to the latitude of Spitzbergen. His own belief and theory is, that the waters of the gulf stream have a greater specific gravity than those surrounding the ice-barrier, for two reasons: first, the immense rain and snow fall of the arctic regions must freshen the water and make it lighter; and, second, water is lightest near the freezing-point. The comparatively warm water of the gulf stream dips and passes northward under the ice-barrier, and emerges, with velocity reduced by corresponding currents from the opposite side of the pole, into the comparatively warm polar sea. The same cause would produce an ascending current of warm air, to exert a marked influence upon the atmospheric currents of the whole northern hemisphere. Such in brief is the normal system of water and air currents, according to the theory of the speaker, whose paper was listened to with special interest. — (*Albany inst. ; meeting Jan. 16.*) [123]

**Sea-otter hunting.** — The sea-otter hunting in the Kurile Islands, now Japanese territory, has been chiefly farmed out to foreigners as a government monopoly. It is now proposed to form a Japanese company for the purpose of carrying on the business on a larger scale than hitherto. The pelts of *Enhydra marina* are the most valuable furs known, and the animal is found only in the Kuriles and Alaska in any numbers. — w. h. d. [124]

**British co-operation in arctic meteorological and magnetic research.**—Letters have recently been received from Capt. H. P. Dawson, R.A., who has been appointed to undertake the work of establishing one of the chain of circumpolar observing stations in the scheme of the international commission, originally suggested by the late Lieut. C. Weyprecht. During the past summer Capt. Dawson, with two observers and an artificer, started for the Hudson Bay Territory with the idea of establishing a station at Fort Rae or Fort Providence on Great Slave Lake. Funds for the expedition to the amount of \$12,500 were guaranteed by the government, \$5,000 by the Royal society, and the Canadian government has since added the sum of \$4,000. It is supposed that this will suffice to keep the party in the field for at least two seasons. When last heard from, all were well, though somewhat late in reaching their destination. It was not certain at last accounts whether one of the posts above mentioned, or old Fort Simpson, would be decided upon; the last-mentioned offering several advantages not shared by the others, though on some accounts less desirable. — W. H. D. [125]

(South America.)

**Early exploration of the Amazon.**—The reprint of P. Texeira's voyage up the Amazon (1637-1638) is continued. — (*Bol. soc. geogr. Madrid*, xiii., 1882, 266-275.) W. M. D. [126]

**Bolivian table-land.**—The plateau southward from Lake Titicaca was explored and surveyed during a part of 1882, by J. B. Minchin, for the Bolivian government. Its altitude is 12,000 or 13,000 feet, with generally level surface, broken by isolated hills and smaller ranges. On the east, the Cordillera Real, or main chain of the Andes, is composed chiefly of stratified rocks, rising to great heights, and culminating in Sorata and Illimani. On the west, the Coast Range is largely volcanic, with some vents still active. Both ranges are metalliferous. The eastern range has copious rains and an ample plant-growth; the western is dryer and almost barren. The Desaguadero, or outlet of Lake Titicaca, flows along the eastern side of the plateau, over low, flat land, very boggy in the wet season, into Lake Poópó or Aullagas, about 50 by 15 miles, but with low banks and variable area. From its south-western angle an outlet, the Laca-Ahuira, carries off what is not lost by evaporation. This stream flows underground for three miles of its course, and farther west is lost in the Salinas de Coipasa, which receives several other rivers, some fresh (Llalluca, Isluga), some brackish (Sabaya, Cariquima): these salinas are about 400 square miles in area, and of dazzling white surface. A little to the south-east begin the great Salinas de Garcimendoza, with an area of 4,000 square miles, a white and perfectly level sheet of salt, three or four feet thick; in the dry season it can be crossed on horseback. The former area of the lake from which these salinas remain is estimated at 20,000 square miles; its old shore-line is marked by a persistent level calcareous incrustation, 200 feet above Lake Poópó. — (*Proc. geogr. soc. Lond.*, Nov., 1882, map.) W. M. D. [127]

(Europe.)

**Southern Russia.**—J. Garnier gives an interesting account of the region about the river Donetz, visited at the end of 1881. Rocks of the coal-measures give a gentle relief to the surface, the greatest difference found between valley and hilltop being only 150 met.; but the surrounding country is more even, a part of the great plain extending to the Arctic Ocean. The climate is consequently variable; very cold and snowy in the winter season, which begins

in October. The rivers and the Sea of Azoff are frozen about four months. A quick change gives warm weather in May, and a fresh vegetation springs up; but the summers are so dry and hot that the harvests often fail. Irrigation cannot be practised, as the streams run in valleys 40 or 50 met. below the general surface. Roads are very bad, except when smoothed over with snow. The peasants pitied the French people who had some winters without snow! Towns are few, and the population is so sparse that the fields are often cultivated only once in three years. Trees are absent, except occasionally on the river-bottoms, and wood is too dear to be used for fuel. The absence of forests is the result, according to Le Play, of the severe climate; Hommaire de Hell says tree-roots cannot penetrate the compact soil; the Cossacks themselves believe the trees have been cut away and not replanted. In spite of many unfavorable conditions, years of good harvest yield immense quantities of grain for exportation. Coal forms an undeveloped resource of the country. It was discovered in the time of Peter the Great, and has lately been studied under the direction of Helmersen; but in spite of its great quantity and excellent quality, it was hardly worked till after the Crimean war; then the better steam navigation of the Black Sea, and the beginning of railroad construction in Southern Russia, gave a new impulse to mining, and in 1881 1,600,000 tons were raised. Still English coal is found in all the ports of the Black Sea. This is largely because the coal from the Donetz mines has no good harbor for export, for the Sea of Azoff is but 4 met. deep at its entrance, the Strait of Kertch; and at Taganrog, its most important port, now connected by rail with the mines, vessels drawing only 3.5 or 4 met. must anchor 25 kil. from the shore, and load or discharge by double transfer to cart and lighter. Although possible with wheat, this is too expensive for coal. The harbors might be much improved by dredging. — (*Bull. soc. géogr. Paris*, 1882, 498.) W. M. D. [128]

(Asia.)

**Across Eastern Gobi.**—Hermann Mandl, a young German, who went to try his fortunes in the East, spent two years learning Chinese at Peking, and was then engaged, in 1880, as interpreter by Gen. Zozung-tang, who was about to lead an army across the desert to Hami in view of possible difficulty with Russia concerning the occupation of Kuldja. Lieut. G. Kreitner, who had been as far as Ansifan two years before, gives a sketch-map and account of Mandl's expedition from Ansifan across Gobi to Hami, and compares it with the description of the same region in 1875 by Major Sosnowski (*Journ. roy. geogr. soc. Lond.*, 1877, 160). Ansifan is in 95° 56' 50" long. E. of Gr., and 40° 31½' N. lat., at an elevation of 1,144 met., on a fertile plain watered by the Sula-ho, which rises in the snowy Nan-san on the south, and flows westward into the desert, ending in the reported Kara-nor. The city suffered greatly in the rebellion of 1868, as did many neighboring towns, and has now only a thousand inhabitants, many of its houses being empty. Kua-Tchou, some twenty miles west-south-west, was at this time completely destroyed, though it still appears on most maps as an important place. On the 26th of July, 1880, Mandl left Ansifan. His party travelled at night to avoid the excessive heat, — the thermometer had registered 107° F. before starting, — and was eleven days on the way, averaging fifty miles to a march. The loose sand of the flat desert, and the rough stony paths over the occasional hills, which sometimes rise 120 feet above the plain, made travelling extremely dif-



ficult; the resting-stations were miserable places, often supplied with bad water from their springs. A few antelope were seen on the way.

Zo-zung-tang's army consisted of 2,500 men, who crossed the desert in divisions of 500 so as not to exhaust the water-supply on the way: they had not been paid for ten months, and their plundering made their advance like an enemy's invasion. But at Hami the people rejoiced at the coming of the holy general, for since his arrival it rained as it had not for a long time before. Moreover, he had posted orders that all brawlers and opium-dealers should be beheaded, all impostors should be punished with 3,000 lashes and should then have their ears bored with a lance, and he advised the people to let the soldiers have nothing till they had paid for it. Hami lies at the southern foot of the eastern extension of the Tian-san, at an elevation of 960 met., with a broad, well-watered pasture-land stretching thirty miles before it to the desert. Its population is 1,500-1,800 (Sosnowski said 10,000) besides a garrison of 3,000. [On Stieler's Atlas, sheet 64, 1881, *Ansifan* is given as *Ngansi Fan tcheu*, and is placed in latitude 39° 40', or more than 50 miles too far south according to these data.] — (*Peterm. mitth.*, 1882, 416, map.)

W. M. D.

[129]

**Russo-Persian boundary and Merv.** — F. v. Stein gives a map and description of the most recent work on the region stretching eastward from the southern end of the Caspian toward the oasis of Merv. A railroad was completed in 1881 from Michailow on the Caspian, south-easterly to Kysyl-Arvat (about 130 miles); and it is now proposed to extend this along the inhabited strip of land between the Kopet Mountains and the Kara Kum (desert) to Ashkhabad, and perhaps to Seraks on the Tedjend (Heri-Rud river). With this object the Russian engineer Lessar has examined the route, and finds it one of very easy grades and construction, for the transition country between mountain and desert is very flat throughout. Levelling showed a depression below the level of the Caspian, about midway on the present railroad; and this is suspected to continue eastward, in which case the Tedjend and Murgab could not in former times have reached the old course of the Oxus, but must after their junction have flowed to the Caspian independently: now they are both lost in the sands of the Kara Kum. The people along the surveyed line gladly accept the present Russian and Persian government of their country, as a guard against the robbing Tekke tribes. The forts or walled towns contain a single street for the bazaars; from this, crooked, narrow, dirty alleys, often shut apart by doors, lead among the mud-huts, the only kind of habitation. In the fields at a distance from the forts, are scattered watch-towers with entrances so small that one must creep through them: the laborers hid themselves in these, blocking up the doorway, on the first appearance of a band of Tekke robbers, and there waiting till they had passed by. In the present better times, the towers are not needed. The former population must have been much larger than the present, for ruins are numerous; but the people have no traditions about their builders. Fields are cultivated only where irrigated; and on the larger rivers, Tedjend and Murgab, dams are constructed to feed numerous branching canals. The districts thus cared for have been much reduced in area in consequence of the plundering of the Tekke bands: the people have been driven off, and the canals are fallen into decay. [The question of the less supply of water is not considered.]

The oasis of Merv, as described by O'Donovan,

an English 'correspondent,' contains a dense population, variously estimated from two to five hundred thousand, gathered in numerous villages, but without any central city. Since 1857, it has been in the power of the Tekke-Turcomans, who were then driven from Seraks on the Tedjend by the Persians. They are hospitable; but they are also cruel, deceitful, lying robbers. The men are poor workers; but the carpets, silks, and especially the silk embroideries, made by the women, are celebrated throughout Central Asia. The oasis is watered by the Murgab, which is raised by a dam, then divided into two arms, these into forty-eight branches, and finally into hundreds of canals: all these are under the control of the Tekke, who rent their use to the under tribes of the district. The possibility of Russian advance to this point is a question of much importance for the future of Central Asia. — (*Peterm. mittheil.*, 1882, 369, map.) [In this connection may be mentioned the accounts of Lessar's explorations in *Proc. roy. geogr. soc.*, iv., 1882, 486; v., 1883, 1; and of O'Donovan's, *id.*, iv., 1882, 345; and his book, *The Merv oasis*, London, 1882.] W. M. D.

[130]

## BOTANY.

(*Structural and physiological.*)

### New apparatus for respiration experiments.

— This consists of a measured flask holding upon moist paper the seedlings under examination, and connected with a supply of oxygen in a balanced eudiometer. The evolved carbonic acid is absorbed by potassic hydrate in a small receptacle suspended within to the cork of the flask. The amount of oxygen consumed can be read off on the balanced eudiometer, which sinks in a bath of mercury as its contents disappear; the carbonic acid produced is ascertained from the potassic carbonate, and from subsequent treatment of the air in the flask at the close of the trial, by means of baric hydrate. A possible objection to this apparatus is the fact, that some time must elapse after it is arranged before the temperature of the flask and eudiometer can be precisely that of the surrounding air. Professor Godlewski has, however, found this error to be in point of fact unimportant. — (*Bot. zeit.*, Nov. 24, 1882.) G. L. G.

[131]

**Basipetal development of leaves.** — Trécul gives an account of the sequence in which the first vessels appear in Cruciferae, asserting that thereby his views as to the basipetal development of leaves are confirmed. — (*Comptes rendus*, Dec. 4, 1882.) G. L. G.

[132]

**The structure of the leaves of heath.** — Ernst Ljungström divides the species of *Erica* into four groups depending on the shape and microscopic anatomy of the leaves. Three types are, *E. cupressina*, *E. stricta*, and *Calluna vulgaris*. A fourth group comprises most of the *Ericae* proper. — (*Bot. notiser*, 1882, 178.) G. L. G.

[133]

**Dispersion of *Utricularia intermedia*.** — A few plants were thrown into a swamp at Oelgheem (Belgium) where the water was shallow. By the following year the species had covered several ares. Last March, M. Gilbert observed on the surface of the water minute vesicles blown hither and thither by the winds, and so abundant in amount as to have the appearance of green velvet. These proved to be detached bulblets of *Utricularia intermedia* formed of whorls of rudimentary leaves on an extremely short axis (see Gray's Manual, under *Utricularia*). After the development of the axis the air, hitherto entangled in the leaves, escapes, and the bulblet sinks to the bottom, where it speedily develops roots. M.

Gilbert notes also that this plant is also dispersed through the agency of the larvæ of caddisflies (a common bait used by anglers). The larvæ have an envelope composed of minute shells, bits of dead wood, fragments of plants, etc.; and sometimes this artificial carapace is furnished with five or six bulb-lets of Utricularia. These are borne about by the larvæ until at an early stage of growth they become detached from them, and then they take root in the earth at once. — (*Bull. soc. roy. bot. Belg.*, Dec. 28, 1882.) G. L. G. [134]

**Fertilization of *Gerardia pedicularia*.**—Professor Bailey, who has already published several observations on the perforation of the flowers of this species by predatory humble-bees, has found that when few of these insects visit the flowers they are not so apt to perforate them. He concludes, with Fr. Darwin, that they only puncture flowers whose nectar they can reach normally, when competition forces them to work very rapidly. — (*Amer. nat.*, Dec., 1882.) W. T. [135]

**Spring floras.**—The influence of temperature has been applied by Dr. Taylor to the explanation of vernal floras. Species that bloom early are frequently identical with, or closely related to, alpine species of the same latitude; and these, as is well known, bear a similar relation to arctic species. Alpine and arctic floras are commonly explained as remnants of the post-glacial flora, which have survived in consequence of the protection afforded by the cold of high altitudes or latitudes. Spring flowers are claimed to receive similar protection by their time of flowering. It is a suggestive fact, that when our early-flowering species also occur at high elevations, or farther north, they bloom much later than with us. — (*Nature*, Nov. 2; *Science gossip*, Dec., 1882; *Bot. gaz.*, Dec., 1882.) W. T. [136]

**Fall blooming of *Menyanthes trifoliata*.**—This plant was found blooming abundantly in Rhode Island on the 23d of October, by Prof. W. W. Bailey. The swamp in which it grew had been desiccated by a long summer drought, which seems to have had upon it the effect of its normal winter rest, so that the following autumn rains and continued warm weather induced a season of general and vigorous bloom. — (*Coult. bot. gaz.*, Dec., 1882.) S. W. [137]

(*Systematic and general.*)

**Jamaica ferns.**—A critical examination of the Jamaica ferns in the herbaria of the British Museum and Kew, by G. S. Jenman, results in the addition of eight new species, with some not before credited to the island, and corrections in previous determinations. — (*Journ. bot.*, Nov., 1882.) S. W. [138]

**New American composite.**—E. L. Greene re-describes from fuller material his proposed new genus, *Holozonia*, intermediate between *Lagophylla* and *Hemizonia*, of a single species (*H. filipes*), found in mountain streamlets east of Napa Valley, California. — (*Torr. bot. bull.*, Dec., 1882.) S. W. [139]

**Forest-trees of the gulf region.**—A similar but more detailed account of the more important forest-trees in the States bordering the Gulf of Mexico, by Dr. Charles Mohr. — (*Ibid.*) S. W. [140]

**Origin of *Cassia lignea*.**—The cassia districts of southern China have been recently visited by Mr. Ford; and the tree which is found to be cultivated there for the supply of Chinese cinnamon, or the cassia-bark of commerce, Professor Dyer of Kew identifies with the *Cinnamomum cassia* of Blume. An account of its cultivation, the preparation of the bark, etc., is given. — (*Journ. Linn. soc. Lond.*, Dec., 1882.) S. W. [141]

## ZOOLOGY.

### Cœlenterates.

**Nature of the green cells of *Hydra*.**—The question whether any animals are able to produce chlorophyll is now attracting considerable attention; and as Geddes and others have stated that such animals as *Hydra* and *Spongilla* do have the power to vegetate their own intrinsic chlorophyll, Dr. Otto Hamann has made a careful examination of the manner in which the green cells make their appearance in the egg of *Hydra*. From the study of sections through the ovarian ovum at successive stages of development, he concludes that the green bodies are not developed in the egg, but that they make their appearance suddenly, and are full-grown as soon as they are found at all; that they migrate into the ovum, through the supporting layer from the endoderm. He thinks that the bodies which Kleinenberg described in the egg, as the early stages of the green cells, are in reality early stages in the development of the pseudo-cells.

Besides examining sections, he has removed the green cells from the body of the *hydra*, and has cultivated them in water; and he finds that when thus treated they thrive and multiply, and are apparently under conditions of life which are as natural as those to which they are exposed in the cells of the animal. They multiply rapidly in both cases by repeated division into fours. He states, on the authority of Dr. Dalmer, that the green bodies of *Spongilla* and *Paramarcium* also multiply by division into fours, and that they will thrive and multiply, like those of *Hydra*, in water. From these reasons, as well as from the fact that they are not formed by the egg of *Hydra*, but migrate into it, and from the fact that they have a cell-wall and nucleus, he concludes that they are algae; and he therefore accepts Brandt's conclusion, that, in every case where chlorophyll is present in animals, we have to do with unicellular algae, which are both morphologically and physiologically independent.

Brandt's statement that a green *Hydra*, when placed among specimens of the brown *Hydra*, inoculates them with its alga, and thus converts them into its own species, he disputes, on the ground that his own experiments in this direction failed, and also for the reason that the two forms are distinguished by many specific characteristics which have nothing to do with the presence or absence of the green bodies. He also doubts the propriety of giving specific names to these algae at present.

As regards the relation between the alga and its host, he believes that the *Hydra* derives no particular benefit from the oxygen given off by the algae, although it may digest them. He does not regard the alga as in any way dependent upon the *Hydra*. — (*Zeitschr. wiss. zool.*, xxxvii. 457.)

A directly opposite view regarding the nature of the green bodies of *Hydra* is advocated by William Marshall, who concludes, from the fact that they remained without change in a *Hydra* which was kept in the dark for six weeks, that they are not algae but are characteristic of the animal itself. He regards the green color of *Hydra viridis* as a protective resemblance to the fresh green plants among which it lives. — (*Ibid.* 665.) W. K. B. [142]

**Interesting observations on *Hydra viridis*.**—The paper last noticed contains a number of facts regarding this species, which, although they are not strictly new, have never received due attention. Marshall has verified Baker's observation, made 140 years ago, that, when a parent *Hydra* is injured, one of the

buds may develop into a parent stock, while the original parent becomes separated, as a bud, from the body of its own offspring. He has also verified Trembly's discovery that *Hydra* sometimes multiplies by transverse fission. He has rediscovered the so-called *anus*, which was described by Folkes in 1742, and by other observers of the last century. It is in no sense an anus, but simply the remnant of the channel of communication between the digestive cavity of the bud and that of the parent.

Baker's discovery, in 1744, that the two tentacles which first appear in the bud lie in the plane which passes through the axis of the body of the mother, has recently been verified by Mereschkowsky. Marshall not only finds that this is the case, but that the reproductive organs appear in the same plane. He also finds that when the tentacles of a full-grown specimen are cut off, the two which are first re-developed lie in this same plane. He therefore concludes that *Hydra* is in a certain sense, a bilateral animal.

His attempts to repeat Trembly's experiment of reversing a *Hydra*, failed completely, like those made by Baker and others; but a Japanese naturalist, Prof. Mitsukuri, has recently been more successful, and has verified Trembly's statement.

Marshall concludes that *Hydra* is, in a certain sense, both a hydroid polyp and a Scyphostoma. — (*Zeitschr. wiss. zool.*, xxxvii. 664.) W. K. B. [143]

**Anatomy and histology of Cyanea.**—Dr. Lindenberg gives a minute and profusely illustrated account of the general anatomy and the histology of a new species of *Cyanea* (*C. Annaskala*) from southern Australia. The paper is Part I. of a monograph on the Coelenterata of the South Sea. — (*Zeitschr. wiss. zool.*, xxxvii. 465.) W. K. B. [144]

#### Mollusks.

**The organ of Bojanus of the oyster.**—Mr. P. C. Hoek, of the zoological society of the Netherlands, has recently published his investigations upon the generative organs and the organ of Bojanus of *Ostrea edulis* L., as observed by him at the zoological station of the society in Bergen-op-Zoom on the Escaut. He finds it to open into the pericardiac cavity, and also communicates with the generative openings on either side. Its principal cavity is a wide canal clothed with epithelial cells bearing very long cilia, communicating with numerous surrounding smaller cavities formed by induplicatures of membrane. This is believed to be its glandular portion. It lies close against the ventral side of the adductor, and extends into the substance of the mantle laterally. — (*Comptes rendus*, Nov. 2, 1882.)

The present writer, in the course of his investigations into the anatomy of *O. virginica* Gmel., has found a somewhat similar paired organ below the great double adductor. On either side it is partially embedded in the mantle; crescent-shaped, as seen from the side; frequently marked by brownish tissue in its walls; about five-eighths to three-fourths of an inch long, and a sixteenth to an eighth of an inch in width at its widest portion. In sections through this organ and the adjacent tissues of hardened specimens, the following details are revealed: A number of large central canals, clothed internally with epithelium bearing very long cilia, and communicating with smaller tubular cavities of irregular form, or with somewhat folded walls, lined with epithelium bearing shorter cilia. The inner non-glandular part embraced the parieto-splanchnic ganglia, sections of which appear in some of the preparations. The connection of the organ with the generative openings and pericardiac cavity was not traced. There can be little doubt but

that what M. Hoek and myself have seen is really the renal organ of these animals. — J. A. R. [145]

**A remarkable molluscan type.**—An interesting discovery has been made during a study by Mr. Dall of the deep-sea mollusks dredged off the Antilles by the U. S. coast-survey steamer 'Blake,' under the supervision of Prof. A. Agassiz. A living species of the genus *Dimya* Rouault is found attached to the margin of dead shells. This genus is fossil in the eocene of the Bos d'Arros, France, a deposit equivalent to that of the Paris basin. The type and sole recognized species until now was first figured by D'Archiac as an *Anomia*; and, in the same year, its true characters were recognized by Rouault. Since then the genus has attracted little attention, being barely mentioned in general treatises. It is traceable continuously through the formations on the Mediterranean, from the eocene to the pliocene; *Ostrea tenuiplicata* of Seguenza turning out to be a *Dimya*, closely allied to the original type of Rouault, to which, however, the recent form from the Antilles is still more similar,—indeed, practically identical. The interest of the discovery does not, however, lie chiefly in its ancient lineage, but rather in the remarkable characters of *Dimya*. It is practically an oyster, with two adductor muscles, and a pearly *outside* to its shell. It combines in itself features supposed to be characteristic of different orders of mollusks, and many separate groups within those supposed orders. The outer layers have a silvery nacre as in some oysters, like which *Dimya* has a porcellaneous inner layer. The hinge has a pit like Hinnites or some pectens, roughened in one species as in *Pseudamussium* Verrilli. The branchiae are of a very primitive type, consisting of long disunited filaments attached to a cord-like band, forming a living fringe. Other and still more peculiar features require more study. It would seem as if the definite establishment of this genus gave the *coup-de-grâce* to the old order Monomyaria. — W. H. D. [146]

#### Worms.

**Structure and development of Dinophilus (a turbellarian).**—*Dinophilus* is a marine rhabdocoeous planarian, resembling externally an annelid larva. A new species (*D. apatris*) was found in the marine aquarium of the zoological institute at Freiburg-im-Breisgau, and forms the subject of a valuable paper by Dr. Korschelt. The female is some thirty times larger than the male; is developed from large eggs, while the male is developed from a small egg. The structure of the female is described in considerable detail, especially as regards the histology. The most characteristic features of the female are the two bunches of setae on the front of the head, the constriction forming a neck, the five rings of cilia around the body, and the proboscis. This last is a *solid* mass attached to the base of a hollow sheath underneath the pharynx; when retracted the posterior end is bent upwards like the leg of an L. The sheath opens just inside the mouth. The proboscis is composed mainly of striated circular muscles, inside of which are longitudinal muscles. The tip is specially differentiated. The proboscis can be thrust out and withdrawn with great rapidity, and probably serves to gather diatoms, etc., on which the animal feeds. It will be remembered that an organ similar in some respects exists in Prostomum, but cannot be regarded as homologous, for it lies above and not below the mouth. The male is not only smaller than the other sex, but shows a rudimentary organization; was observed to live ten days only, while the females were kept alive for months.

In the course of development two polar globules are formed. Segmentation is complete but unequal. There is a well-marked gastrula; the larva is completely formed, except the sexual organs, upon leaving the egg. Korschelt attempts to show a relationship of Dinophilus with the rotifers. (K. labors under several serious misapprehensions as to the characteristics of Rotifera.)—(*Zeitschr. wiss. zool.*, xxxvii. 315.)

In a supplementary note he calls attention to the fact that Metschnikoff, in an article on the Orthonectidae (*Zeitschr. wiss. zool.*, 1881, 299), had previously made mention of the sexual dimorphism of Dinophilus.—(*Zeitschr. wiss. zool.*, xxxvii. 702.) c. s. m. [147]

**Parasites of elephants.**—In spite of the importance of elephants as domestic animals, very little is known of their parasites. Cobbold has published a list of the species known at present, with descriptions and annotations. He mentions the following: *Ascaris lonchoptera*; *Sclerostoma sipunculiforme*; *Strongylus clathratus*; *S. foliatus* n. sp.; *S. falceifer*, n. sp.; *Dochmius sangeri*, n. sp.; *Filaria Smithii*, n. sp.; *Ascaris histomata* Hawkesii; *A. ornatum*, n. sp.; *A. papillatum*, n. sp.; *Fasciola Jacksoni*; making eleven species of helminths, besides which there are known three insect parasites, —a bot, *Gastrophilus elephantis*; a huge louse, *Hæmatomyzus elephantis*; and a mite, *Homopus (Symbiotes) elephantis*. The paper closes with a few practical considerations, of a necessarily desultory character, on the parasitic diseases of elephants.—(*Trans. Linn. soc. Lond.*, zool. ii. pt. 4, 223.) c. s. m. [148]

#### Insects.

**Coleoptera of Cincinnati.**—A supplementary list of 167 species is added to the 1,419 of his earlier catalogue by C. Dury. No notes are added.—(*Journ. Cinc. soc. nat. hist.*, v. 218.) [149]

**Rearing Tortricidae.**—Some good hints as to the best means of rearing larvae of this group are given by C. G. Barrett; the main secret of course being how longest to preserve succulent leaves from either moulding or withering when removed from the plant.—(*Ent. monthl. mag.*, No. 224.) [150]

**Transformations of *Endotricha flammealis*.**—An excellent life history of this pyralid moth is traced with care by W. Buckler, the transformations being previously unknown. The eggs are laid in varying situations late in July; the caterpillar, which is strongly given to cannibalism when reared in confinement, hatches early in August, and in September conceals itself, when not feeding, in a singular web; this is partitioned into several chambers, often as many as from three to five, one above the other, openly wrought, the larva occupying different chambers indiscriminately, curled tail over head. The larva generally hibernates, becomes full fed in May, and appears on the wing in July.—(*Ent. monthl. mag.*, No. 223.) [151]

**Moths of New Mexico.**—A list of 98 species collected by F. H. Snow is given by A. R. Grote, with descriptions of new forms, and preceded by some general remarks. He finds an admixture of sub-tropical forms, with some "representatives of European species not yet found near either our western or eastern seaboard," mentioning particularly a species of *Copimamestra*. A summary of the characters used in establishing genera in the Noctuidæ, the author's special study, is added.—(*Ann. mag. nat. hist.*, Jan., 1883.) [152]

**Oviposition in *Argynnis*.**—Dr. Henry Skinner called attention to a curious departure from the usual habit of lepidoptera in the case of *Argynnis Cybele*,

which drops its eggs from a height upon grass and violet leaves, instead of depositing them, as in the case of all other species known to him, upon the leaves of the plant upon which the insect is to feed.—(*Acad. nat. sc. Philad.*; meeting Jan. 23.) [153]

#### VERTEBRATES.

**Destruction of red blood corpuscles in the liver.**—It has long been supposed that the red blood globules were to a great extent broken up in the liver, giving rise, among other things, to the bile pigments. The experimental proof, however, has been unsatisfactory. R. Nicolaides finds on careful enumeration, by Melassez's method, of the corpuscles in blood drawn from the portal and hepatic veins of rabbits, dogs, and cats, that the number is always much less in the hepatic vein.—(*Archiv. de physiol.*, x. 1882.) H. N. M. [154]

**Electrical irritability of the spinal cord.**—Schiff contributes new experiments on this much-disputed point. His general conclusion is, that no directly irritable elements can be demonstrated in the spinal cord, apart from the paths of the nerve-roots.—(*Pflüger's archiv*, xxix. 1882.) H. N. M. [155]

**Uses of the bile.**—From observations made on dogs with biliary fistulæ, and carefully prevented from licking up the outflowing bile, F. Röhmman concludes that the ill results of excluding this secretion from the intestine have been over-estimated. His animals, when fed on dog-biscuits, remained apparently normal in all regards for weeks: no diarrhoea nor signs of unusual putrefactive decompositions in the intestine occurred; nor did ill results follow adding a moderate amount of flesh or of fat to the diet. Much flesh or fat, however, caused digestive disturbances after a few days. When soap was given, these were very marked and severe. The intestine deprived of bile can very well serve to do all necessary for the maintenance of the bodily functions; but it is so far in an abnormal state as to have its power of resisting injury, or indiscretion in diet, greatly diminished.

As regards the absorption of fats, he finds, as others, that this is much diminished when the bile is drained off through a fistula. Very little of the unabsorbed fat, however, leaves the body as such; the greater part of it being broken up, so that the excreta contain much free fatty acids. Possibly the unusual accumulation of these in the intestine is the immediate cause of its special liability to lesion.—(*Pflüger's archiv*, xxix. 1882.) H. N. M. [156]

#### Birds.

**Contributions to the anatomy of birds.**—The osteological papers of Dr. Shufeldt, originally printed in the twelfth annual report of the U. S. geological survey, have also been separately published. The papers on the burrowing owl, the horned lark, the Tetraonidae, and the shrike, need but little comment, since they have been published some time. We notice, however, the addition of woodcuts of the live birds, and certain changes in the text.

The last paper, that on the Cathartidae, is of much later date. The descriptions are based on a good supply of skeletons in the Smithsonian museum and in the Army medical museum. They are illustrated by several plates and woodcuts. Special points of interest are the extensive air-canals, the solidity of the atlas, the variations of the sternum in the same species, the presence of a claw on the ungual phalanx of the first digit. The author finally concludes that the present division into genera is justified from an osteological point of view. He also agrees that there is no close relationship between the old and new

world vultures, the former being a group of the Galconidae. — J. A. J. [157]

**Lymph-hearts in the embryo chick.** — From the observations of Panizza, Meyer, and Stannius (*Müller's arch.*, 1843, 452), it is known that lymph-hearts occur in various birds, but they have not hitherto been observed in gallinaceous forms. In structure they vary from a rudimentary to a functionally perfect condition. These facts lead Dr. Albrecht Budge to consider it probable that they are always developed, and when absent in the adult, have been atrophied. Upon investigation he succeeded in finding them in the embryo chick. He was successful in injecting the lymphatics in embryos from ten days old upwards. There are two hearts on the back, between the coccyx and pelvis. They enlarge until the time of hatching, after which they both disappear, although one is frequently lost sooner. Small vessels connect them with the *vena hypogastrica* on the one hand, and with the lymphatics, especially of the allantois, on the other. The heart is lined with an endothelium, and its wall is composed of connective tissue and spindle-shaped muscle cells. The organ pulsates independently of the blood-pulse, under favorable circumstances, sixteen times a minute: the pulsations could be first seen on the eighth day. The dissecting out of these hearts is difficult, as soon after the twelfth day they become covered by fat. — (*Arch. anat. physiol., anat. abth.*, 1882, 350.) C. S. M. [158]

#### Mammals.

**Fossil peccary from New York.** — Dr. Jos. Leidy described two skulls and several portions of the skeleton of a fossil peccary from New York. The remains belong to *Platygonus compressus*, and were in a state of such remarkable preservation as to appear recent. — (*Acad. nat. sc. Philad.; meeting Jan. 23.*) [159]

**The phylogeny of the Sirenia.** — Prof. E. D. Cope described a portion of the jaw of a large sirenian mammal, containing an incisor tooth or tusk, characteristic of the genus *Halitherium*. The specimen was from the vicinity of Charleston, S.C. It exhibits the peculiarity of possessing, exterior to the tusk, a second large tooth, which is probably also an incisor. This character was believed to distinguish the form generically from the other members of the order, and the name *Dioplotherium* was proposed for the genus thus defined. The species was named *D. Manigaulti*; and, from the proportions of the parts preserved, it was believed to have been rather larger than a dugong.

The genus furnishes a first step in tracing backwards the phylogeny of the Sirenia. These animals doubtless present the same phenomenon as that witnessed in the lines of the rhinoceroses, ruminants, and some others; viz., — a gradual reduction in number, and final extinction, of the superior incisor teeth. In *Rhytina* the extinction is complete; in *Halicore*, one remains. *Dioplotherium*, with two, forms the passage to the primitive types, not yet known, which possessed three. They are considerably specialized in the present genus, and a reduction of size is to be looked for in the first genera of the Sirenia. — (*Acad. nat. sc. Philad.; meeting Feb. 5.*) [160]

**Synovial membranes.** — A monograph of their development and structure, by Oscar Hagen-Torn, has just appeared. A fissure arises by the degeneration of cells between the cartilages. The surrounding connective tissue with many but not essential changes from the embryonic cellular condition of the neighboring mesoderm becomes the synovial membrane. The enlargement of the fissure is attributed to move-

ments of the joints. In extra-uterine life the synovialis disappears at the points of great pressure, is thinned out where there is a medium pressure, and acquires the papillose character on the other parts, which are especially exposed to the influence of the negative pressure which arises during the articular movements. — (*Arch. mikr. anat.*, xxi. 591.) C. S. M. [161]

**Embryology of the milk-glands.** — G. Rein summarizes the results of his extended researches on the development of the milk-glands. The same type of formation was found in all the species investigated. Gegenbaur has maintained, that the majority of mammals have their teats formed by an upgrowth of the area in which the lactic glands are developed; but that in ruminants there is another type, the glandular area forming a depression, the walls of which grow up around it into a teat. Rein, however, demonstrates that the ruminants conform to the usual development. His investigations may be summarized as follows: The first trace of the milk-gland appears very early, usually when the visceral clefts are closed; in man, during the second month. The gland first appears as an ingrowth of the epidermis. The connective tissue of the nipple is next formed; the teat may be developed early (ruminants, horse, etc.), or at the end of foetal life (man). Next secondary outgrowths arise from the primitive epidermal bud, as many as there are ducts in the adults. At this period the differentiation of the stroma from the mesoderm begins. Most of the primitive ingrowth disappears, a little remaining as the common orificial duct. The secondary epithelial growths, on the other hand, grow farther, become tubular, branch, and finally form the ducts (sinus and ducts proper) and the acini. In the human foetus all the parts of glands are developed by the time of birth. The development is according to this same plan in all the animals investigated, comprising species of Primates, Insectivora, Carnivora, Ungulata, Glires, and Didelphyda. The so-called Montgomery glands are rudimentary milk-glands. The view advanced by Creighton and Talma, that the acini are developed from the mesoderm, is incorrect. The milk-glands cannot be regarded as modified sebaceous glands, but are organs *sui generis*. — (*Arch. mikr. anat.*, xxi. 678.) C. S. M. [162]

**Distribution of the genus *Macroscelides*.** — According to M. J. Huet, this genus, as now known, ranges over all Africa, except the western portion between the tropics of Cancer and Capricorn. — (*Mission G. Révoil aux pays Somalis.*) F. W. T. [163]

**Anatomical and external characters of *Zalophus gillespii*.** — W. A. Forbes publishes two chromolithographs of the exterior of the Californian sealion, and the following notes together with others: No true scrotum; four inguinal mammae; no under fur; tongue bifid at the apex; stomach less globular and more elongated than in *Otaria jubata*; intestines much longer, and liver less differentiated, than in the latter species; an innominate gives off right and left carotids close together; trachea very wide; spleen flattened and elongated; kidneys compound. The color of the fur is described at length, and measurements are given. The full-length figures in the first plate strike one as being unnaturally stiff. — (*Trans. zool. soc. Lond.*, xi. 1882.) F. W. T. [164]

**Mammals of Essex Co., England.** — Notes by H. Laver upon forty species, including seven cetaceans and the seals *Phoca vitulina* and *Cystophora cristata*. — (*Trans. Epping Forest nat. club*, ii. 1882, 157.) F. W. T. [165]

## Man.

**Age of the mother, and sex of the child.**—According to Schramm and Bidder, it appears that we may consider twenty to be the age of the most perfect female maturity; that it is at that age that women bear the largest proportion of girls; that, the farther they pass beyond that age, the more the proportion of the male to the female children increases. Rumpe deals with this question, especially as regards primiparae. He divides his cases into those where the mother was under thirty (young), and those over (old). For the old primiparae, Rumpe had 63 boys against 52 girls, or 121 : 100.

Other authors have found as follows, for *old* primiparae:—

	Boys.	Girls!
Schramm . . . . .	132	100
Ahlfeld . . . . .	137	100
Hecker . . . . .	133	100
Krüger and Winckel . . . . .	133	100

The mean proportion of all births, independent of the mother's condition, is 106 boys to 100 girls. If this increase in the relative number of boys depends on the age of the mother, then it must be the case also with multiparae. Rumpe cites 400 cases to show that it is so: 200 multiparae under thirty gave birth to 96 boys and 104 girls; i.e., 92 : 100; 200 multiparae over thirty gave birth to 110 boys and 90 girls; i.e., 122 : 100. The conclusion is therefore confirmed, that, the older the mothers, the larger the proportion of boys born. — (*Arch. f. gynœk.*, xx., 1882, 129.) c. s. m. [166]

**Asymmetry of the turbinated bones in man.**—According to Dr. H. Allen, this may exist independently of or involving the nasal septum, and is probably due to pre-natal influences. — (*Proc. acad. nat. sc. Philad.*, 1882, 239.) F. w. t. [167]

## PEDAGOGY.

**The use of slates.**—Prof. H. Cohn of Breslau believes that the use of slates by school-children tends to produce short-sightedness; and would substitute either pen and ink, or an artificial white slate with black pencil manufactured in Pilsen, and already introduced into a few German schools. In 1878 Horner found (*Vierteljahrsschrift öffentl. gesundheitspflege*, x. 4), that B and E could be read, if black on white ground, 496 cm.; if white on black, 421 cm.; and if gray on black, 330 cm.; and ascribed the greater difficulty with white letters to irradiation. The reflection of light from the surface of slates is, it is said, enough alone to cause their disuse. The school-board of Zürich has forbidden the use of the slate after the first term (primary year), and many teachers and oculists advocate the substitution of white-boards for black-boards. The noise of slates; dirty habits formed by erasures; bad positions favored by reading the less legible script; a heavy hand; and the habit of twisting learned with a pencil, and to be

unlearned with a pen,—these, it is said, are obviated by the use of pen and ink at the outset. The obvious objections are, that children can occupy themselves better with slates, and from pencil to pen is from the easier to the harder.—G. s. h. [168]

**Curriculum in Prussian gymnasia.**—The most important changes in the recent revision of the study-plans of the Prussian gymnasia, which had remained essentially unaltered between 1856 and 1882, are as follows: 1. One hour per week less of Latin during the first five, and two less during the secunda years. Greek begins one year later, but for four years gains an hour per week. Writing and religion receive also less time. 2. What is thus gained is divided nearly equally between French, history and geography, mathematics, physics and natural science, and drawing. Save in the reduction of Latin, the change is slight, but significant, and much discussed, as a departure towards the plan of the real-school.—G. s. h. [169]

**School savings-banks.**—The advisability of school savings-banks elicits much discussion in Germany. On the one hand, it is claimed that pupils may be taught self-denial, foresight, interest in great mercantile and other operations remote from their own narrow lives; encouraged in bookkeeping; saved from the noxious effects of bad confectionery; if poor, encouraged in helping their parents; and ideality and healthful moral sentiments cultivated by directing their plans for future use of their money to beneficent objects. On the other hand, the opponents of school-banks urge, that they encourage a commercial view of life prematurely; that, as school-children seldom earn money, they will be stimulated to tease or steal it from their parents or others, when, to be properly possessed, money should be earned; and that this is not the most pedagogic method of instruction. The plan has perhaps been most fully tried in Ghent, where, out of 15,392 scholars in the lower schools, 13,032 have accounts in the school savings-banks of the place; the average for each depositor being about 35 francs (seven dollars).—G. s. h. [170]

**Herbart's works.**—The first volume of a new edition of Herbart's works, just published by Veit & Co., contains his pedagogical writings. As Herbart was the first to attempt to give a scientific character to pedagogy, and a more or less philosophical one to Pestalozzi's incoherent insights, his historic significance is great; although advance has been made beyond his position by his followers in pedagogy (Beneke, Diesterweg), as well as by his philosophical disciples. A number of critiques and other interesting *inedita*, the existence of which seems to have been unknown to the compilers of the former Hartenstein edition, add considerably to the value of the new edition.—G. s. h. [171]

## INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

## GOVERNMENT ORGANIZATIONS.

## National museum.

**The fisheries exhibition.**—Mr. T. W. Smillie, photographer of the museum, is preparing a series of photographs to accompany the fisheries exhibit, which will be sent to London in the spring. The views, many of which are those of fishing-vessels and boats in motion, were taken by an instantaneous process.

The positives, which measure 30 × 40 inches, and are, perhaps, the largest photographs ever taken for display without crayoning, are obtained by aid of the electric light. The rays from a Brush lamp are passed through an achromatic condenser 13½ inches in diameter, thence through a negative and through a large portrait-lens; they are then thrown upon a screen placed at a distance of 7 or 8 feet from the camera. A sensitized sheet of paper, of dimensions a little